

Application No.: 09/581,878
Attorney Docket No.: FUK-71
Amendment Dated: 8 August 2005
Reply for Final Office Action Dated: 7 February 2005

REMARKS

Claims 1-10, 12, and 13 are pending in the application.

The fee associated with the enclosed Petition for Extension of Time reflects the difference between a two-month and three-month extension of time fee, as a two-month extension of time and associated fee were submitted with the filing dated 11 July 2005 replying to the Final Office Action.

Claims 12 and 13 have been amended. Applicant respectfully requests that the objection be withdrawn.

Claims 1 and 2 have been amended. No new matter is added by the claim amendments. The claim amendments are fully supported by the original disclosure.

Regarding the amendments made to Claim 1, the added recitations to an "upper" and "lower" vacuum vessel plate are supported by subject matter already existing in the version of the claims as previously presented (e.g., the Claim 2 recitation directed to "a vacuum vessel with a top and bottom plate"). Moreover, the added recitations to a "bellows" and "O-ring" are supported by subject matter already existing in the version of the claims as previously presented (e.g., the Claim 2 recitations pertaining to "bellows" and "O ring").

Claims 1-4, 6-10, and 12-13 stand rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 5,580,420 to Watanabe et al. ("Watanabe") in view of U.S. Patent No. 5,314,574 to Takahashi.

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The Examiner states that Watanabe meets the recited cylinders of the claims with gate valve 15. The Examiner states that Watanabe does not disclose, inter alia, the recited "O ring" and "bellows." ("Watanabe et al. does not expressly disclose ... that the cylinders are provided with an O-ring and that the cylinders are connected to the bottom plate through bellows.") However, relying upon the Takahashi disclosures pertaining to bellows 22 and sealing member 21, the Examiner states that it would be "obvious to one having ordinary skill in the art .. to modify the apparatus disclosed by Watanabe et al. as to further comprise the claimed O-ring and bellows [of Takahashi] in order to optimize the apparatus by tightly sealing the chamber and by freely expanding and compressing the lifting/lowering mechanism." (Insertion added.)

The manner of the proposed modification is not manifestly apparent from the statement of rejection. However, based on the Examiner's identification of correspondence between the Watanabe disclosures (gate valve 15, top plate 3) and the relevant claim limitations, it appears that the modification envisions the interposition of sealing member 21 (Takahashi) between gate valve 15 and top plate 3 (Watanabe), and the connection of bellows 22 (Takahashi) to gate valve 15.

Referring to the Advisory Action dated 26 July 2005, the Examiner indicates that the motivation to combine the references is not found in any teaching or suggestion drawn from the prior art. Rather, the motivation to combine is premised on the knowledge of persons of ordinary skill in the art. Specifically, the Examiner states:

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In this case, the motivation to combine the Watanabe et al. and Takahashi references is found in the knowledge generally available to one of ordinary skill in the art. (Advisory Action, Continuation Sheet.)

As discussed further, Applicant respectfully submits that it would not be obvious to make the proposed modification, as the Examiner maintains. The rationale to make the proposed motivation -- namely, "to optimize the apparatus by tightly sealing the chamber and by freely expanding and compressing the lifting/lowering mechanism" -- is insufficient to sustain the rejection, as there is no basis in the "knowledge generally available to one of ordinary skill in the art" to combine the references in a manner that would make the proposed modification obvious. Additionally, the express teachings of the cited art teach away from the proposed modification.

Briefly, the Examiner proposes to place the Takahashi sealing components at locations in Watanabe completely different from where Watanabe itself develops the sealing action (and also different from where Takahashi itself uses its cited sealing components). The modification attempts to place the Takahashi sealing components at locations in Watanabe (ring gate 15) which neither Watanabe nor Takahashi even consider as a hermetic sealing area. To Watanabe, ring gate 15 merely serves as a wafer conveyance channel. The Takahashi elements cited by the Examiner (bellows 22, sealing member 21) provide sealing at a completely different location than the recited "bellows" and "O ring" of the claims, namely, at the wafer support stage instead of a cylinder surrounding the wafer support stage (as in the invention).

It is not considered that one skilled in the art -- relying merely upon "knowledge generally available to one of ordinary skill in the art" -- would find it obvious to use the

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Takahashi sealing elements at a location in Watanabe that is different than both the location expressly taught by Takahashi for use of such sealing elements and the location expressly taught by Watanabe for deploying its own sealing components.

Takahashi states in relevant part concerning its hermetic sealing arrangement:

The loading platform 18 is arranged atop the intermediate cover 19. For sealing *against an annular shoulder 20 projecting inwardly from the container 2*, the circumference edge of the intermediate cover 19 has a third sealing member 21 made of a corrosion resistant material. When the intermediate cover 19 is pressed upward against the shoulder 20, a hermetically sealed condition is established.

In addition, as indicated in FIG. 3, one end (upper end in the figure) of a second bellows 22, ... is hermetically connected to the outer circumference edge of the intermediate cover 19. The other end (lower end in the figure) of this bellows 22 is hermetically connected to a bottom cover 23. (Col. 4, lines 27-42.)

In Takahashi (Figs. 1 and 3), the arrangement of bellows 22 and sealing member 21 is provided in sealing relationship to disc-shaped cover 19, which carries loading platform 18 bearing wafer W. (Cover 19 is vertically movable by mechanism 24). Sealing member 21 is disposed at the upper surface of cover 19, while bellows 22 is disposed at the underside of cover 19. As shown in Fig. 1, the outer periphery of cover 19 overlaps with an annular shoulder 20 of container 2, so that a seal is formed between container 2 and cover 19 (at sealing member 21) as cover 19 is raised into contact with shoulder 20. (Col. 4, lines 27-53.)

Takahashi employs bellows 22 to essentially connect the wafer stage 18 (via cover 19) to bottom plate 23, while the sealing member 21 of Takahashi connects cover 19 to container 2 (at shoulder 20). The hermetic seal of Takahashi is formed by actuation of air cylinder 24, which

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raises cover 19 (and wafer platform 18) until there is sealing contact (via sealing member 21) between the upper surface of cover 19 and shoulder 20 of container 2.

The hermetic sealing arrangement of Takahashi is completely unlike the hermetic sealing configuration of the invention. The hermetic sealing components in Takahashi (bellows 22 and sealing member 21) are configured solely with wafer stage 18 (via attachment to wafer support cover 19). However, in the invention (Fig. 2), the sealing configuration employs bellows 106 and O-ring 108 with a cylinder 107 that surrounds wafer stage 105. The invention uses the raising and lowering of cylinder 107 (and not the wafer stage as in Takahashi) to selectively control the gap (and hermetic seal) formed with top plate 103.

Takahashi teaches the use of the cited sealing components exclusively and solely with a wafer stage. It is not considered that one skilled in the art -- relying merely upon "knowledge generally available to one of ordinary skill in the art" -- would find it obvious to use the Takahashi sealing elements at a location in Watanabe that is different than both the location expressly taught by Takahashi for use of such sealing elements and the location expressly taught by Watanabe for installing its own sealing components.

Applicant submits that the modification to Watanabe is not consistent with the Takahashi disclosures specifically concerning the deployment of bellows 22 and sealing member 21 only with a wafer stage cover.

Referring to Watanabe, while the Examiner proposes to modify gate valve 15 to incorporate the hermetic seal components of Takahashi, Watanabe instead discloses hermetic

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sealing at a location (loading member 34) that is completely separate and apart from gate valve 15.

Watanabe discloses as follows in relevant part:

Reference numeral 15 denotes a ring gate for partitioning off the buffer chamber 3 *to form the processing chamber 6; ... (Col. 7, lines 20-22.)*

The ring gate 15 is provided as a cylindrical gate valve for separating the processing chamber 6 from the channel 102 as a specimen conveying space in the buffer channel 3. (Col. 10, lines 28-30.)

... the microwave penetrating window 66 is pressed against the upper end portion of the vacuum vessel 67 by making use of the difference in pressure so as to keep the interior of the vacuum vessel 67 airtight. (Col. 13, lines 45-48.)

Then a loading member 34 is forced by the wafer lifting mechanism 14 to airtightly contact the bottom of the load lock chamber 4 to form a load lock chamber...(Col. 8, lines 20-23.) (Emphasis added.)

In Watanabe, ring gate 15 merely serves as an adjustable valve to permit a wafer to be conveyed into the processing chamber. The sealing in Watanabe is expressly provided by loading member 34 and microwave penetrating window 66. Applicant submits that one skilled in the art -- strictly on the basis of "knowledge generally available to one of ordinary skill in the art" -- would not consider it obvious to employ the sealing elements of Takahashi at the location proposed by the Examiner (ring gate 15), especially in view that Watanabe expressly discloses sealing devices (loading member 34, window 66) entirely unrelated to the location for ring gate 15 and further that Takahashi expressly discloses that its cited sealing elements are employed at a location different than the one where the Examiner attempts to make the modification in Watanabe. Although Watanabe does disclose that gate valve 15 serves as "a ring gate for

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partitioning off the buffer chamber 3 to form the processing chamber 6", it is loading member 34 (and not gate valve 15) that provides the hermetic sealing.

At best, if anything, one skilled in the art may recognize utilizing the Takahashi elements (bellows 22 and sealing member 21) in the same manner as taught by Takahashi, i.e., between the periphery of the wafer specimen stage and the top and bottom covers of the container. However, this combination would not produce the invention, where the bellows and O-ring are disposed for connection with the cylinder that surrounds the specimen stage. At best, Takahashi indicates -- in connection with sealing member 21 and bellows 22 relied upon by the Examiner -- that these components can be placed in sealing relationship to a wafer stage carrying the semiconductor wafer, i.e., cover 19 that carries platform 18 laden with wafer W. Nowhere does Takahashi disclose the use of these components in connection with a cylinder that surrounds wafer platform 18.

Regarding the rationale offered in support of the modification, namely, "to optimize the apparatus by tightly sealing the chamber and by freely expanding and compressing the lifting/lowering mechanism", Applicant submits that this rationale has no basis in the "knowledge generally available to one of ordinary skill in the art."

The rationale directed to "freely expanding and compressing the lifting/lowering mechanism" has no bearing on the use of a bellows and O-ring for purposes of hermetic sealing and therefore seems unclear in terms of its relevancy to the modification. In Watanabe, for example, there is no expansion or compression function associated with the mechanism 36 (air

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cylinders) that the Examiner cites to meet the recited "lifting/lowering mechanism" of the claims. The air cylinders 36 of Watanabe adjust the vertical movement of ring gate valve 15 and function regardless of whether there is a bellows or O-ring associated therewith. Indeed, even in the invention (Fig. 2), though the lifting/lowering mechanism 109 does effectuate an expansion/compression of bellows 106 as mechanism 109 adjusts the vertical position of cylinder 107, the lifting/lowering mechanism 109 itself is not improved or enhanced by the arrangement of O-ring 108 and bellows 106.

It seems that the rationale directed to "freely expanding and compressing the lifting/lowering mechanism" appears to already presuppose the existence of a bellows (at ring gate 15) which is then capable of "expanding and compressing" by action of the "lifting/lowering" mechanism 36. Specifically, the rationale appears to presuppose the existence of the modification, and then states an advantage of the modification ("freely expanding and compressing"), instead of serving as a basis for making the modification in the first place.

Even allowing, for discussion purposes and without admission, that the knowledge of one skilled in the art would recognize that a bellows itself has an expansion/contraction capability, it nevertheless would not necessarily be obvious to one skilled in the art -- simply on the basis of this recognition -- to deploy a bellows as a sealing element at the specific location set forth in the invention, namely, extending between the bottom plate of the container and a movable cylinder surrounding the substrate stage. Furthermore, this rationale -- by its citation to "freely expanding and compressing" -- appears only to be cited as a basis for making the modification concerning

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just the bellows and not the O-ring, as an O-ring has no such features of "expanding and compressing." Accordingly, this rationale cannot support the rejection as a basis for establishing that the modification is obvious to one skilled in the art.

Referring to the other cited rationale directed to "optimize the apparatus by tightly sealing the chamber", Applicant submits that there is no basis in the "knowledge generally available to one of ordinary skill in the art" of any optimization scheme that employs a bellows and O-ring in the manner of the invention, namely, connection to a movable cylinder surrounding the wafer specimen stage. Admittedly, one skilled in the art would recognize generally the need to provide sealing of the environment during processing. Indeed, as noted above, Watanabe and Takahashi both expressly disclose sealing arrangements (though unlike the invention). However, without further substantiation, there is no "knowledge generally available to one of ordinary skill in the art" of any optimization protocol from which to draw the conclusion that it would be obvious to render the proposed modification on the basis that it provided optimization.

In view of the foregoing, Applicant respectfully submits that Claims 1 and 2 are patentably distinguishable over Watanabe in view of Takahashi, and respectfully requests that the rejection of independent Claims 1 and 2 (and Claims 3-4, 6-10, and 12-13 dependent therefrom) be withdrawn.

Separately, Applicant has amended Claims 12 and 13 (and added new Claims 14 and 15) to recite the indicated fixed permanent stationary feature not taught or suggested by Watanabe or Takahashi considered alone or in combination. No new matter is added with the claim

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amendments and newly added claims. Support for the claim amendments and newly added claims may be found in the original disclosure, e.g., Figs. 2, 5, and 6.

In Watanabe, the relevant teachings pertain to wafer lifting mechanisms 14A, 14B (Fig. 1A) and drive mechanism 69 (Fig. 4) for vertically moving the specimen stage 68. Watanabe states in relevant part:

...; 68 a specimen stage for loading a wafer as a specimen; 69 a drive mechanism for vertically moving the specimen stage; ... (Col. 9, lines 51-53.)

The specimen stage 68 is provided with the drive mechanism 69, so that the upper portion of the specimen stage is made vertically movable. (Col. 10, lines 3-5.)

The adjustable movement of specimen stage 68 by drive mechanism 69 is an essential feature of Watanabe because it is used to achieve a desired position of the processing plasma relative to the specimen-loading surface, i.e., specimen stage 68 has no fixed permanent stationary relationship to the container bottom. (See Col. 15, lines 1-10; Col. 16, lines 15 et seq.; Col. 16, lines 63-67; and Col. 17, lines 5-10.)

In Takahashi, a raising and lowering mechanism is provided in the form of an air cylinder 24 for raising and lowering the intermediate cover 19 that supports loading platform 18 upon which the semiconductor wafer W is disposed, i.e., platform 18 has no fixed permanent stationary relationship to the container bottom. (See Fig. 1; Col. 4, lines 5 et seq., specifically lines 46-53).

Accordingly, the fixed permanent stationary feature set forth in Claims 12-15 is not disclosed by the cited art. Rather, the art teaches away from such a feature.

Claim 5 stands rejected under 35 U.S.C. §103(a) as being unpatentable over Watanabe in view of Takahashi, as applied to Claims 1-4, 6-10, and 12-13 above, and further in view of JP10-177994 to Masahiro et al. ("Masahiro").

Applicant believes that the application is in condition for allowance and respectfully requests favorable action in accordance therewith.

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If the Examiner has any questions or comments that would advance prosecution of this case, the Examiner is invited to call the undersigned at 260/484-4526.

Respectfully Submitted,



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RJK/jrw2

Enclosures: Amendments to the Claims
(6 Sheets)
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I hereby certify that this correspondence is being deposited with the U.S. Postal Service as first class mail in an envelope addressed to: Commissioner for Patents, PO Box 1450, Alexandria, VA 22313-1450, on: August 8, 2005.



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August 8, 2005

Date